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(54) IMPROVEMENTS IN GRIP-ACTUATABLE STEERING-WHEEL-CONTROL SWITCHES

(71) We, HENRY ARTHUR SCULTHORPE and ISLA PAMELA SCULTHORPE, both British subjects, both of Flat 1, 29 Cliff Street, Manly, in the State of New South Wales, Commonwealth of Australia, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The invention relates to grip actuatable, steering-wheel-control switches. Such switches when fitted to or built into a motor vehicle steering wheel and when embodying the invention, are intended to provide the driver of that vehicle with a means of operating electrical equipment, or mechanical equipment, that can be adapted to be operated by an electrical force, connected with the vehicle without the driver having to remove his hands from the steering wheel, and without having to use his feet, thereby reducing reaction time. Also in keeping with the safety slogan "KEEP YOUR EYES ON THE ROAD" a switch embodying the invention does not require visual checking to locate before operation.

Hitherto control switches that have been fitted to or built into motor vehicles for the use of activating electrical equipment have been dependent upon the mental alertness of the driver to co-operate visual stimulus with some form of active limb or digital response, either by pressing a button, or flicking a switch or some other definite movement. A switch fitted to or built into the spokes of a steering wheel has the added disadvantage of not being in a constant place due to the fact that the steering wheel is rotated when turning corners or manoeuvring. A disadvantage of known switch controls fitted to or built into production line motor vehicles' steering wheels is the amount of reaction time between visual stimulus and effective operation. This makes them suitable only for non-emergency equipment. For example, most present steering wheel control switches would not be suitable for motor vehicles' brake controls, a few exceptions being expensive custom built systems for disabled driver vehicles.

Steering wheel switch controls are commonly designed to be dependent upon a driver's definite action, the ones regarded as a new approach sometimes comprising only a change in the shape or position of the switch. When it is a change in position this often becomes a safety hazard as the driver may have to take his eyes off the road to operate the switch.

One object of the invention is to reduce driver reaction time, and the corresponding distance travelled during that time, of a motor vehicle in motion by utilising the entire circumference of a motor vehicle steering wheel as a switch control when subjected to a gripping action by a driver, to activate electrical or mechanical equipment with little delay.

The gripping action provides the actual control and is not a preaction to a control, and is not a postaction to limb movement to activate a control. In a switch embodying the present invention the gripping action is a controlling agent, and gives to the driver of a vehicle to which a switch embodying the invention has been fitted or built into the steering wheel, the folllowing methods of switch control:

1. Visual stimulated direct muscular reaction control;
2. Tactile stimulated instantaneous muscular reaction control;
3. Responsive reflex muscular reaction control.

These methods of control are available because the driver of the motor vehicle does not have to remove his hands from the steering wheel circumference, nor does the driver have to change the position of his hands on the circumference of the steering wheel, to operate a switch embodying the invention.

The moment that a driver takes hold, in

any position, of the circumference of a motor vehicle steering wheel that is fitted with a switch embodying the invention, the driver has almost instant availability to operate a desired control. The control may be electrical equipment, or mechanical equipment, that can be adapted to be operated by an electrical force. There are many and various mechanical forces, and liquid forces that can be used with, or as a substitute for, electricity, and there can be combinations of some, and all, to activate electrical or mechanical equipment to be used in conjunction with a switch embodying the present invention.

A number of uses may be made of the invention, listed as follows:

1. To light an individual warning signal at the rear of motor vehicle saying STOP, STOPPING or any other desired warning word.
2. To be connected to operate the motor vehicle stop lights apart but in addition to normal brake pedal pressure.
3. To activate the rear brakes only of a motor vehicle as an extra system but not replacing the hand brake system.
4. To activate all four brakes of a motor vehicle as an addition to not instead of the present normal braking systems.
5. To operate all four present brakes of a motor vehicle instead of the present foot pedal control but retaining the hand brake.
6. To activate any spot light or other forward directed lights.
7. To activate the windscreen washers or wipers.
8. To act as an emergency cut to the ignition electrical power supply.
9. To replace any standard switch with a switch embodying the invention.

The above examples may be used singly, or in combinations of more than one, with the invention.

The following Motor powered Vehicles which have steering wheels to control the direction of travel could all benefit from the invention if fitted thereto:

1. Motor Cors, Commercial Vans, Trucks and Articulated Transport;
2. Motor Powered Farm Tractors and Earth Moving Equipment;
3. Motor Speed Boats, Hydrofoils, Hovercraft;
4. Aircraft with Full Circumference or Cut Away type of Steering Wheels.

All the above, if the invention were to be fitted or built into their steering wheels, could use the invention to activate desired electrical equipment for normal or emergency use.

Many different arrangements may be made within the broad scope of the invention and it is to be appreciated that the invention is not to be limited to the specific examples given, and the types of Motor Powered Vehicles stated. For this reason we do not give details of how it may be connected to various types of equipment and therefore we do not limit the uses to which the invention may be put.

The invention provides a grip-actuatable steering-wheel-control switch for controlling the operation of electrically operable equipment associated with a motor powered vehicle, the switch comprising in combination a resilient tube affixed to or forming part of the underside of the entire circumference of a vehicle steering wheel; an expandable and contractable tube which is connected to or is an extension of the said resilient tube, the two tubes together forming a closed hydraulic system: and a hydraulic pressure switch provided with electrical contacts for wiring in circuit with the electrically operable equipment it is desired to control, the hydraulic pressure switch being responsive to expansion or subsequent contraction of the expandable and contractable tube, to energise or de-energise a circuit across the electrical contacts and thereby to control the operation of the electrically operable equipment.

The invention further provides a method of controlling electrically operable equipment associated with a motor powered vehicle, comprising the steps of providing in association with the steering wheel of the vehicle a grip-actuatable steering-wheel control switch embodying the invention: making electrical conection between the electrically operable equipment to be controlled and the electrical contacts in the hydraulic pressure switch of the grip-actuatable steering-wheel-control switch and then applying or releasing grip pressure as required to or from the said resilient tube.

The expandible tube may be connected to the resilient tube by means of a T-piece adaptor or the resilient tube with the expandible tube forming an extension thereof, may be built into the steering wheel during manufacture thereof so that a separate T-piece adaptor would not be required as an extra fitting but may be made as part of the steering wheel moulding.

The resilient tube may be fitted to an already manufactured steering wheel by incorporating the tube into what is known as a "steering wheel glove". When the steering wheel glove is slipped onto the motor vehicle steering wheel with the tube on the underside of the steering wheel, this places the resilient tube in the most effective position relative to the steering wheel.

The steering wheel glove may be fastened

in place by any of the usual method or may be self supporting.

One embodiment of the invention will now be described by way of example with reference to the accompanying drawings wherein

Figure 1 is a diagrammatic view of a steering wheel control switch constructed according to the invention;

Figure 2 is a part sectioned, perspective detail view of a pressure sensitive switch shown diagrammatically as part of Figure 1; and

Figure 3 is an "exploded" view of the top and bottom halves of a rotary fitting shown diagrammatically as part of Figure 1.

Referring to the drawings, a car steering wheel 10 has a flexible tube 11 fitted around its circumference. Hydraulic fluid is contained in the tube 11. The tube 11 may be made from any suitable resilient material and desirably is incorporated into a steering wheel glove, which is then fitted onto the steering wheel 10 so that the tube 11 is on the underside of the wheel rim. A T-piece adaptor 12 is used to connect the tube 11 to a tube 13 as shown in Figure 1. The tube 13 is inserted into a hydraulic pressure switch 14 shown diagrammatically in Figure 1 and held in position by way of a cap 33, so that when tube 13 expands under hydraulic fluid pressure it pushes against the head of a plunger 37 thus causing the end of the plunger 37 to connect with a terminal screw 32 in another cap 34. The hydraulic pressure switch 14 has a terminal 31 on its body. From these two terminals 31 and 32, two flexes 15 and 16 lead to corresponding terminals (not shown) on the top half 17 of a rotary fitting. The top half 17 revolves with the steering wheel in use. The bottom half 20 of the rotary fitting comprises two metal rings 21 and 22 which are in constant contact with pressure pads 18 and 19 respectively. Two terminals 23 and 24 come from the underside of the bottom half 20 of the rotary fitting and have leads 25 and 26 attached to them, lead 25 coming from a negative power supply 27 and lead 26 going directly to an item 29 which is to be operated, with a positive power supply 28 also going directly to said item 29.

Obviously negative and positive may be reversed or, where the car body is used as a general earth, either source 27 or 28 may go to the car body and the other to the power supply as required. The provision of a rotary fitting is to allow transference of electrical current to and from the switch 14 without the need for long loose wires which otherwise would be necessary to allow for the revolving of the steering wheel. Desirably the rotary fitting may be moulded in a plastics, non-conductive material. It would be necessary to make the two halves of the rotary fitting each in two pieces. The two pieces of the top half may be held together with screws but the bottom half may be fixed to the top of, say, the direction indicator box with self tapping screws.

The hydraulic pressure switch 14 comprises a housing 30. An internal screw 43 on the cap 33 fits over the housing 30 and is threaded to allow minor pressure adjustments. The cap 33 into which is fitted the tube 13, holds the tube 13 firmly. A screw 44 on cap 34, made of a non-conductive material, serves as an insulator for the terminal screw 32. This screw 44 allows of further fine adjustments. A hole 35 is provided in the cap 34 through which hole 35 fits the terminal screw 32. Two locking nuts 41 and 42 hold the terminal screw 32 in position in the cap 34 and also allow extra adjustment. A plunger 37 is provided with an easy sliding fit in the bore of the housing 30, and is operated by expansion of the end of the tube 13. The sealed end of tube 13 is made with a thinner wall which, when a grip made on the steering wheel 10 forces liquid to flow from tube 11 into tube 13, expands and extends under the increased pressure of the liquid within the tube 11. Despite the expansion of tube 13 it cannot withdraw from the cap 33. The tube 13 thus forces the plunger 37 along the bore of the switch 14 to push against the end terminal 32 thereby completing an electrical circuit.

A light coil spring 38 is provided beneath the head of the plunger 37 to assist return thereof when the hydraulic pressure is released. Numerals 39 and 40 denote the places where two locking nuts (not shown) may be inserted to hold caps 33 and 34 in place when adjusted.

It is essential that the following parts be of an electrically conductive material: Housing 30, Pressure pads 18 and 19. Metal contact rings 21 and 22, Plunger 37, and all Flexes and Terminals.

It is essential that the following items be of non-electrically-conductive materials: Cap 34 which acts as an insulator, Top half of rotary fitting 17, Bottom half of rotary fitting 20.

It will be apperciated from the foregoing that an electrical circuit on a motor vehicle that could be connected to a switch could, instead, be connected to the two terminals 23 and 24 on the bottom half 20 of the rotary fitting. Instead of a switch lever being flicked, which takes considerable reaction time, a tightened grip on the steering wheel circumference would almost instantaneously complete the circuit and effect the desired result. Cars that have hollow steering columns would not require the rotary fitting; this includes many cars that have collapsible steering columns.

The present invention could be used also for several other purposes; e.g. by use of existing stop lights as warning device, it could be connected so that whilst allowing the action of the brake pedal to operate the stop lights when the driver is stopping in a normal manner, it can in an emergency situation by a tight grip of the steering wheel circumference activate the stop lights sooner than the brake pedal does. Thus warning the driver of a following vehicle in sufficient time for him to stop.

For the purpose of showing the desirability, the benefit, of the present invention reference is made to the New South Wales (Australia) Handbook as issued by the Department of Motor Transport.

A driver's reaction distances are given as follows:

at 20 miles per hour reaction distance is 28 feet

at 30 miles per hour reaction distance is 45 feet

at 40 miles per hour reaction distance is 60 feet

at 50 miles per hour reaction distance is 75 feet

These distances are not exaggerated as they are based on a reaction time of only 1 second.

WHAT WE CLAIM IS:—

1. A grip-actuatable steering-wheel-control switch for controlling the operation of electrically operable equipment associated with ea motor powered vehicle, the switch comprising a resilient tube affixed to or forming part of the underside of the circumference of a vehicle steering wheel; an expandable and contractable tube which is connected to or is an extension of the said resilient tube, the two tubes together forming a closed hydraulic system; and a hydraulic pressure switch provided with electrical contacts for wiring in circuit with the electrically operable equipment it is desired to control, the hydraulic pressure switch being responsive to expansion or subsequent contraction of the expandable and contractable tube, to energise or de-energise a circuit across the electrical contacts and thereby to control the operation of the electrically operable equipment.

2. A switch as claimed in claim 1 wherein the resilient tube and the expandable and contractable tube are connected together by means of a T-piece adaptor.

3. A switch as claimed in claim 1 or claim 2 wherein the resilient tube is incorporated into a steering wheel glove fitted over the steering wheel rim so that the resilient tube is located on the underside of the rim.

4. A switch as claimed in any one of the preceding claims wherein the hydraulic pressure switch comprises a spring-loaded plunger, movable in the bore of a switch housing in response to changes in the pressure on the said plunger caused by changes in the pressure of the hydraulic fluid in the expandable and contractable tube.

5. A grip-actuated steering-wheel-control switch substantially as hereinbefore described with reference to and as illustrated in the accompanying drawings.

6. A method of controlling an electrically operable brake associated with a motor powered vehicle, comprising the steps of providing in association with the steering wheel of the vehicle a grip-actuatable steering-wheel-control switch as claimed in any one of the preceding claims; making electrical connection between the electrically operable brake to be controlled and the electrical contacts in the hydraulic pressure switch of the grip-actuatable steering-wheel-control switch; and then applying or releasing grip pressure as required to or from the said resilient tube.

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2 SHEETS *This drawing is a reproduction of the Original on a reduced scale*
Sheet 1

Fig. 1.

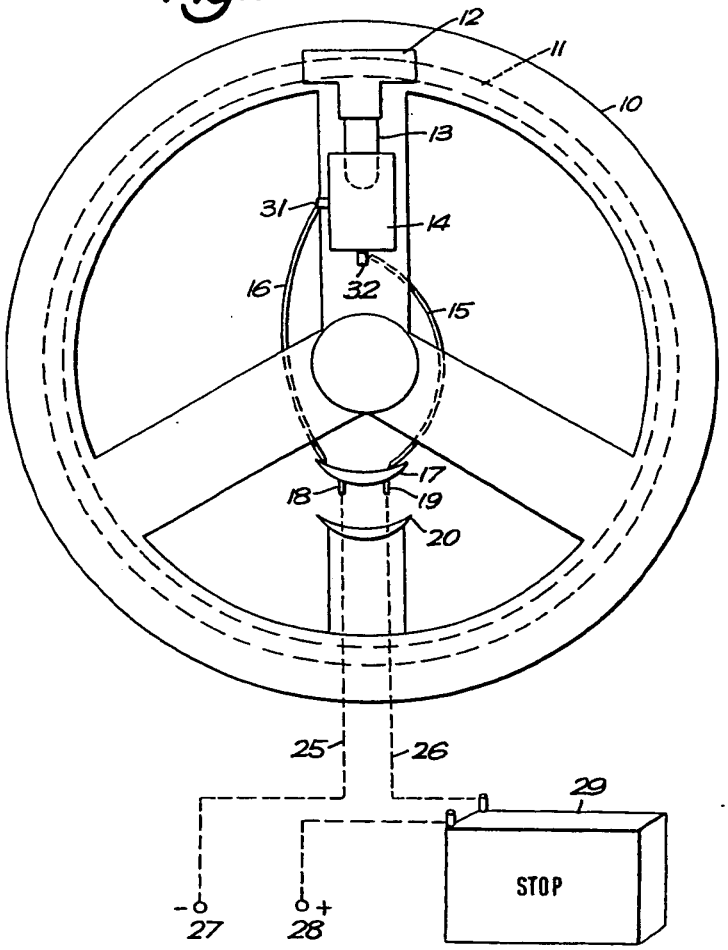

Fig. 2.

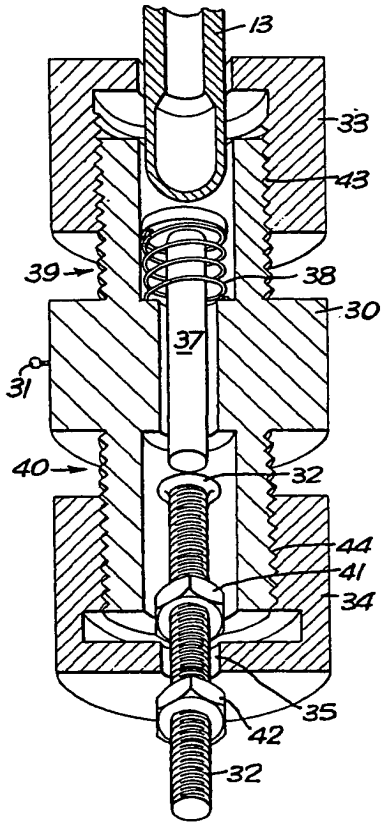

Fig. 3.